Lake Calumet Cluster Site
Briefing with Management, OU2 RI
July 8, 2020

Site Location:

- 87-acre site includes U.S. Drum, Alburn Incinerator, Unnamed Parcels and Paxton Lagoons
- Southeast Chicago in heavily industrialized area, adjacent to wetland (Indian Ridge Marsh)
- Bordered by Land of Lakes landfill to west, Norfolk railroad to the east, Paxton I and II Landfills to north, and 122nd Street to south.

Background:

- 1900's-1970's- Extensive historical filling from nearby steel mills/ industries (slag, other waste material, etc.). Raised ground surface to just above water table.
- 1940's-1992 – Unpermitted waste disposal (industrial, chemical wastes)
- Site listed on NPL in 2010

- OU1 (Landfill) ROD issued 2006 (presumptive remedy). Landfill cap partially constructed in 2006 but State ran out of money to complete cap in 2008. PRPs asked to complete groundwater OU2 RI/FS before finishing OU1 cap construction.

Geology:

Table 1: Summary of Geologic and Hydrogeologic Nomenclature

Current Geologic Name	Former Geologic Name	Hydrogeologic Name	Description
Fill material	Fill material[1]	Calumet aquifer[3]	Municipal and industrial waste, slag, reworked soil[2]
Henry Formation	Dolton Member of the Equality Formation; Dolton Sand		Predominantly sand; shore and shallow-water lake deposits
Equality Formation	Carmi Member of the Equality Formation	Confining unit[3]	Predominantly silt and clay; well bedded or laminated lake deposits
Wadsworth Formation	Wadsworth Till		Silty and clayey till/diamicton, hard and becoming denser with depth
Racine Formation	Racine Formation; Racine Dolomite	Silurian-Devonian aquifer[4]	Dolomite pinnacle reef complexes including reef and interreef deposits

Notes:

OU2 (Groundwater) RI:

- 35 Piezometers installed (21 perimeter and 4 interior)
- 24 HPT borings (all 50 feet deep to top of clay) – None thru the entire thickness of clay confining unit
- 9 monitoring wells installed in shallow "aquifer?" (water w/in fill material) . No wells in deeper Silurian (bedrock) Aquifer.


Big Marsh
Conservation Area
Acme Coke Plant
Paxton II Landfill
Paxton I Landfill
North Indiana Ridge Marsh
Land & Lakes Landfill
Cluster Sites
Lake Calumet
Gull Island
Gun Club
Heron Pond
South Indiana Ridge Marsh
SEPA
Industrial Site
Deadstick Pond
MWRD Facility
Calumet River
0
1,200
2,400
Feet
SITE LOCATION
LEGEND
LAKE CALUMET CLUSTER SITE BOUNDARY
BORING LOCATION (THICKNESS OF CONFINING LAYER)
LESS THAN 50'
GREATER THAN 50'
APPROXIMATE LOCATION OF TARP
LAKE CALUMET CLUSTER SITE
CHICAGO, ILLINOIS
CONFINING LAYER THICKNESS
ARCADIS
FIGURE
2

PRPs Basis for Assertion/Lines of Evidence:

1. ***Regional geologic and hydrogeologic literature documents widespread presence of confining unit and confirms site specific observations regarding presence and properties of confining unit is consistent with regionally mapped conditions.***
    - Underlying clay unit at site is part of known, regional geologic feature mapped extensively in Lake Calumet Region. Kay 1996, 2002, ISGS
    - Presence, lateral continuity, and thickness of regional clay unit confirmed by regional studies and RI data

2. ***Regional data/mapping (ISGS) sources confirm the confining unit near the Site is 50 feet or greater in thickness.***
    - Regional mapping (*Kay, 1996)* confining unit thickness is 50 to 75 feet.
        - Corroborated by soil boring data from 18 deep soil borings drilled and logged down to the Silurian bedrock. 18 borings completed in vicinity of Site (only two are adjacent to LCCS – (See Figure 1).
            - *13 deep soil borings by IEPA as part of Interlaken Site-Big Marsh)*
            - *4 deep soil borings at Paxton I and II Landfill and Land of Lakes landfill* (surround the LCCS site to north and west)
            - 1 deep by MWRD southwest of LCCS and 122nd street (3,500 ft of site)
        - Closest borings northern boundary of site (Paxton landfills) ranged from 57 to 74 feet thick.

3. ***Site specific RI data indicate that the confining layer is laterally extensive with the unit encountered at 35 soil borings at LCCS, and that the upper portion of the confining unit, which directly underlies the fill materials, and potential sources of contamination at the site , is fine-grained, uniform in character and of high plasticity. The uniformity and plasticity of the material encountered make vertical fractures or other preferential transport pathways unlikely.***
    - Piezometer installation 35 (shallow, shallow, and 6 deep (all perimeter with 4 interior).
        - Confining Unit (CU) encountered at 6 deep piezometer locations during RI:
            - PZ-1S -16.5 feet
            - PZ-3D - 8 Feet (Depth of penetration into CU)
            - PZ-5D – 4 feet
            - **PZ-7D – 21 feet**
            - **PZ-8D – 7 feet**
            - PZ-10D 0 12 feet
        - Continuous soil samples of CU collected at each (6) deep boring locations
            - CU described as dark gray, highly plastic, laminated bedding, no fractures; consistent with lacustrine clays (confirmed by literature)

        - Hydraulic Conductivity (K) range 10-6 to 10-9 cm/s (but not verified in field)
            - Based on observed lithology
            - Consistent with observed K values published for Region

- Laminated bedding in upper portion of CU consistent with lacustrine deposits of region (literature). Highly plastic (can tie boring core in knot (see picture)) (no fractures/no permeable seams observed in cores)

- HPT (24) borings- to determine permeability
  - HPT responses consistent with higher and variable K within fill material and low permeability unit, corresponding to the CU encountered at base of borings.
  - At 5 locations, lithologic data collected adjacent to HPT borings to correlate the HPT response to different units at site. CU characteristics observed at HPT borings consistent with logged soils from piezometer installation.
  - A decrease in flow and increase in pressure observed at contact between fill and the clay CU
  - Total thickness of CU not verified during RI. HPT borings terminated in CU and did not penetrate full thickness of unit.

4. ***Regional measurements of vertical hydraulic head differentials between Calumet Aquifer and Silurian Dolomite Aquifer indicate they are not connected, and that the CU is an effective barrier to downward flow.***

   - GW elevations more than 70 feet deeper in deeper Silurian Dolomite Aquifer compared to shallow Calumet Aquifer Downward vertical head differential exists between Calumet aquifer and Silurian bedrock Aquifer.
   - Based on magnitude of head differential, data strongly indicate lack of hydraulic connection b/t shallow Calumet Aquifer and deep Silurian Aquifer.

5. ***MWRD's Tunnel and Reservior Plan (TARP) System consists of tunnels within the Silurian Aquifer used as storage and conveyance for combined sewer overflows, and hydraulic interactions b/tw the tunnel and Silurian Aquifer documented. The current use of the Silurian Aquifer to manage combined sewer effluent eliminates potential residential and commercial water uses of Silurian Aquifer in the Site area.***

Figure 1 – Site Location

Figure 2 – RI Sampling Locations

Figure 3 – Cross Section A-A"

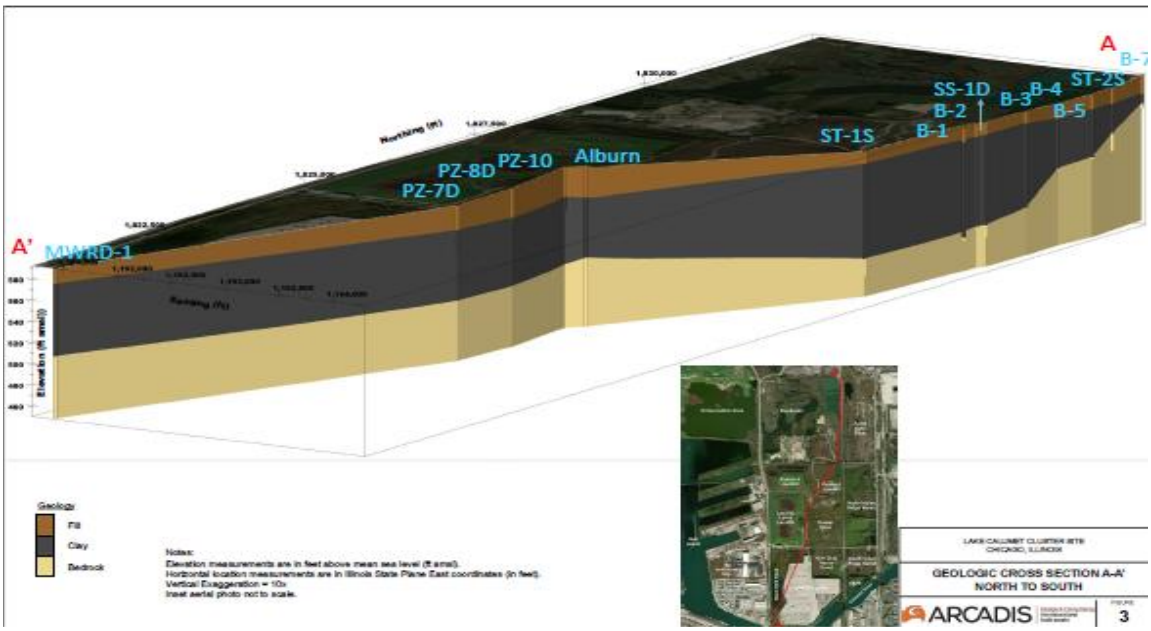
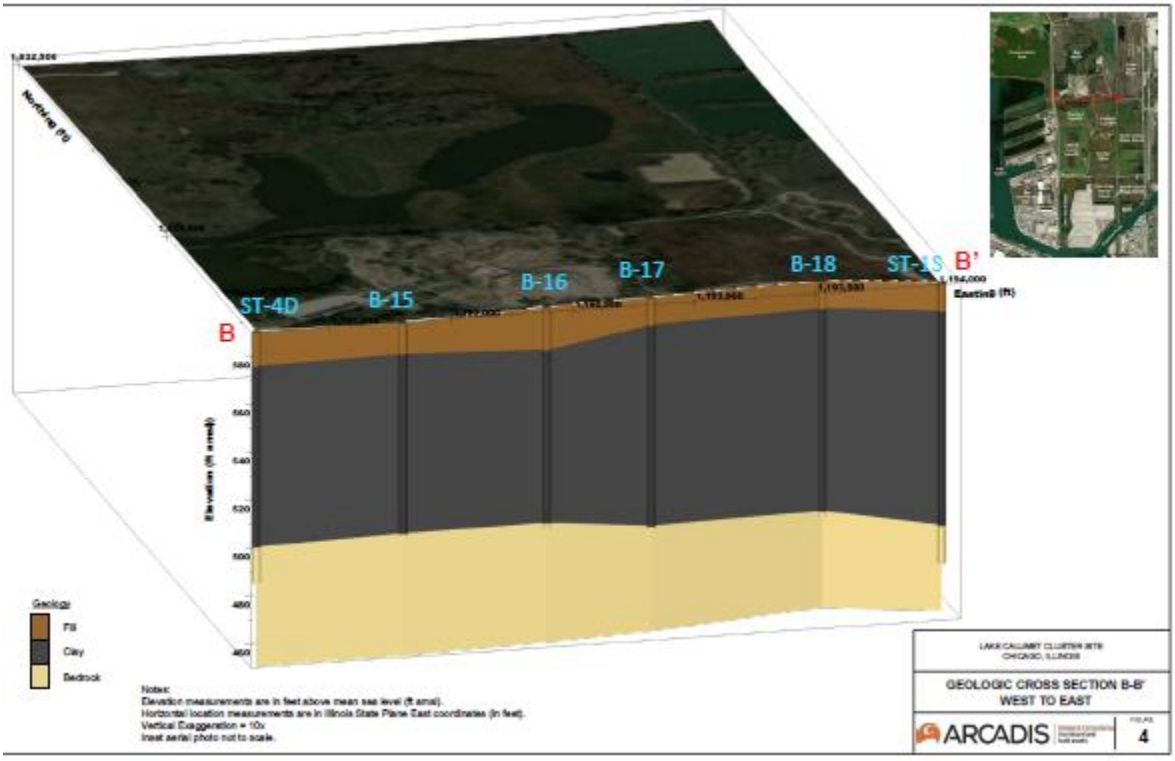


Figure 4 – Cross Section B-B"



Not Included In Handout

Four PRP Submittals:

1. Groundwater Assessment Technical Memorandum (ARCADIS July 2017)
    a. EPA raised concerns re: Clay layer as effective aquitard
    b. EPA suggested to install monitoring wells installed thru fill into Silurian Dolomite Aquifer to evaluate gw quality in bedrock aquifer
    c. PRPs serious concerns drilling well thru fill material and confining layer will contaminant bedrock aquifer. Not needed based on existing regional and site specific data – already demonstrative clay layer is effective barrier.

2. Memorandum: Review and Assessment of Geologic Data on the Clay Confining Layer and Other Relevant Information, October 31, 2018 (ARCADIS).
    a. EPA Issued Comments on April 11, 2019; suggested geophysical methods to map potential preferential pathways and thickness of clay, hydrogeologic testing including permeameter (veritical K) and slug or pump testing (horizontal K) using nested wells; geotechnical tests for physical properties of drift beneath site (grain size, etc.)
3. Summary of Technical Information Regarding the Confining Unit, RI/FS, August 19, 2019 (ARCAIS)
    a. EPA comments embedded in report.

4. Summary of Technical Information Regarding the Confining Unit, RI/FS, EHS Support Cover letter dated November 26, 2019 , (Supersedes Tech Memo dated October 31, 2018).
    a. Addresses EPA comments

EPA/PRP Meetings:

- October 18, 2017 EPA/State/PRP
- July 10, 2019 EPA/PRP Meeting
- November 15, 2019 EPA/State/PRP Meeting

Pore water within fill is not considered “groundwater” under Illinois regulations.